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Si technology is limited by the presence of the silicon oxide in both the active and passive regions of the integrated circuit in a number of ways. A main limitation is the sensitivity of the oxide to radiation flux. The radiation creates traps and other charged defects in the insulator which alter the internal voltage thresholds in both active and passive regions within the integrated circuit. After a certain cumulative exposure level, these threshold changes render the circuit inoperable. The gate oxide creates limitations in other ways as well. The Si CCD couples one pixel to the other via overlapping gates. Each overlapping gate creates a small region of thicker oxide between pixels which inhibits charge transfer and therefore sets a speed limitation upon the CCD. These oxide barriers are fundamental to the Si CCD and constitute a transfer speed limitation. Some approaches have been employed to eliminate these effects such as the virtual phase CCD. However, these structures are then faced with barriers created by implant misalignment and a lack of well capacity. In any event the transfer speed in the Si CCD rarely exceeds a few MHz.

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A further limitation of the Si CCD is its spectral sensitivity. The Si CCD absorbs radiation across its energy gap and therefore is insensitive to radiation with a wavelength longer than about 1um. It is also insensitive to UV radiation ,

III-V device structures based upon GaAs substrates have the potential to overcome the above limitations. In particular, the GaAs CCD has the potential to absorb within a quantum well between the various subbands. This provides the GaAs device with unique capabilities of intersubband absorption and sensitivity in the mid wavelength infrared, long wavelength infrared and very long wavelength infrared regions. The GaAs device structures that currently perform the intersubband detector functions are the QWIP